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THE CURRENT ENERGY SITUATION IN AFRICA

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		Page
1.	Introduction	1
2.	Status of primary energy resources in Africa:	1 - 3
	(a) Reserves	1 - 2
	(b) Production	2
	(c) Consumption	3
3.	Energy market in Africa	4
4.	Energy policies	5 - 7
5.	Prospects for the future	8 - 9
6.	Conclusion	9

Annex

1. Introduction

Energy planning shares a common goal with other economic and social programmes promoting long-term development. The goals of energy planning in Africa are to ensure consistency between energy objectives and other national priorities and to optimize energy mixes by taking into account interfuel substitution possibilities, conversion efficiency and available investment and technical assistance.

Recently in Africa there has been a regional scramble to explore for domestic energy resources explained by the need of self-sufficiency in energy production. The great majority of African member States still heavily rely on import of energy and the increase in the oil prices has put a considerable strain on their balance of payments.

This paper gives the general overview of the current energy situation in Africa. One aim of the paper is to show the interest and work of ECA in energy field and to try to define an African strategy and a plan of action for the development and utilization of the countries' energy resources that could change the supply costs of energy and improve the current energy situation. The need for an African strategy and plan of action in the energy field is evident given the region's paradoxical situation as compared to the rest of the world. Although it has been established that Africa is rich in conventional energy resources, particularly fossil fuels, and produces more than it consumes the continent heavily depends on energy imports. In the paper the emphasis was put on primary energy resources (petroleum, natural gas, coal, hydropower) because they continue to play a vital role in the energy mix in the African developing countries. Besides another paper by the ECA secretariat on the role of new and renewable energy resources (solar, geothermal, biomass etc.,) in future will be presented to the workshop at the later stage.

2. Status of primary energy resources in Africa

(a) Reserves:

Energy resources of Africa (Annex 1) are immense and constitute a great share of the world energy resources, but unfortunately until now some of these resources are still inadequately studied. Although the figures in the table showed the wide range of estimation they are very impressive and convincing. In real figures the energy resources in Africa are estimated as follows: 341.0 billion tons of coal, 57.8 billion barrels of crude oil, 189,423 billion cubic feet of natural gas, 1.35 million tons of uranium, 26,000 tons of thorium and 200,000 of MW hydroelectric potential.

Concerning solid fuel resources, coal being the major commodity, the African countries do not properly exploit these resources. In view of the present energy situation in Africa it is reasonable to expect that member States rich in coal will reserve a greater consideration to the exploration and development of their coal resources. Taken as a whole the hydrocarbons are still going to play an important role in the economics of African countries. With this in mind there should be a major regional effort to find and develop additional oil and gas fields. It is especially important that the oil importing developing countries of Africa build the needed infrastructure to support hydrocarbon exploration and development in

Africa. Africa has significant reserves of oil shales and tar sands as it could be seen from the following figures (in million tons, oil yield 41.7 litre/ton): Zaire - 7,376.2; Morocco - 90.0; Madagascar - 2.0. It is expected that by 1985 Morocco may produce up to 2.5 million tons of oil from shales thus reaching self-sufficiency in liquid fuels. However, Zaire has the greatest potential for development of oil shales,which are extremely high quality there.

Another source of energy which deserves a special attention is uranium, which although mined in Africa has not yet been used a source of energy here.

(b) Production:

In 1981 energy production in Africa amounted to 499.7 million tons of coal equivalent and this is a sharp decrease in production compared to the figure of primary energy production in 1979 (618.1 million tons of coal equivalent). This considerable drop in energy production in Africa reflects the overall decrease in energy production in the world attributed to the energy crisis and soaring prices for basic energy carriers such as crude oil. During the sixties, the continent experienced the average annual growth of energy production around 22 per cent, but it substantially declined to 1.2 per cent yearly in the seventies.

Production of solid fossil fuels in Africa in 1981 reached 108,681 thousand metric tons of coal equivalent showing the slight increase in absolute figures. Crude oil production in Africa in 1982 dropped down to 220.6 million tons of oil which is slightly less than the production in 1981 (227.2 million tons). If the production figures of 1982 are compared to those in 1981 the average drop in production by the major producers (Nigeria, Angola and Algeria) was around 7.0 per cent. In some member States (Cameroon, Congo, Egypt) the production during the same period went up in the range of 10 - 20 per cent.

Production of natural gas in Africa registered a significant increase in seventies and reached 79.1 billion cubic metere in 1981. However, in 1982, the production of natural gas dropped considerably and hit the low figure of 32.63 billion cubic m. The highest decrease was observed in Libya and Nigeria.

Few data available for evaluation of production of uranium in Africa because of very sensitive character of this issue. In 1981 Niger produced 4,500 tons and Gabon's production was bout 1,000 tons. Uranium production in Africa is hampered by two major negative factors: depletion of deposits and non-utilization of the product on the continent.

Although Africa has vast resources of hydropower only a small fraction of it have been exploited to-date. In the last few years, the production of hydro electricity registered however a substantial growth, thus, in 1975, the continent produced 131,363 million Kwh and in 1981 production reached 187,859 million Kwh.

(c) Consumption:

The developing countries in Africa found it very difficult to curtail significantly their energy consumption despite higher energy prices. The average annual growth of energy supplies in developing countries (Africa included), real and projected one for the period 1970-2000 was calculated as 3.95 per cent. The average annual growth rate of total consumption of primary energy in African developing countries was around five per cent during the latest 25 years. The consumption of commercial energy in Africa continued to rise in eighties.

Consumption of solid fuels in Africa was 83.2 million metric tons and except for negligible quantities, all African production of solid fuels is internally consumed.

The share of crude petroleum and natural gas liquids in the primary energy consumption in African developing countries is still great and the majority of them heavily rely on import of crude oil and petroleum products. Oil importing developing countries in Africa find that 30 per cent or even more of their total export earnings are absorbed by the cost of oil imports alone, the figure which is prohibitively high if viewed in the light of simultaneously growing foreign currency requirements for national development in general. The rate of increase in consumption was closely associated with growing capacity of African refineries which was 6 million tons in 1960, 40 million tons in 1970, 67.5 million tons in 1975 and 83.0 million tons per year in 1979. Current African refining capacity is 40 refineries capable to process 93.4 million tons of crude per year. In 1980, the consumption of crude oil in Africa reached 63.5 million tons, which is 21.1 per cent of the total production (300.3 million tons) that year.

Consumption of natural gas in Africa is rather low because of the low demand by the industry and due to some difficulties in the transportation and storage. However, quite a number of petroleum producing countries in Africa realized the necessity to utilize both petroleum and natural gas. The facilities for that exist now in Algeria, Libya and Nigeria. Congo and Gabon already use natural gas in industry. Consumption of natural gas in Africa in 1981 reached about 16.8 billion cu.m. The above figure does not include the natural gas produced and measured, about 40 billion cu.m. of gas but being flared in the oil producing countries of Africa. There is practically no consumption of uranium in Africa and whole production is exported, however, in view of recent trends and latest developments in peaceful uses of nuclear energy in Africa the situation may change in the forthcoming years.

The consumption of electricity in Africa follows the production figures, and the electric energy nowadays plays a vital role in the national balances of energy in African member States.

3. Energy market in Africa

In current eighties most of the African developing countries experienced a substantial deterioration in their terms of trade. The economic stagnation in the developed market economies sharply reduced the demand for and prices of many raw materials and commodities exported by African developing countries. Both oil prices and interest rates rose dramatically, the rate of exchange of US dollar was unfavourable too, and since the increased volume of concessionary assistance did not match the increase in current account deficits, developing African countries had to increase their reliance in higher cost private sector financing. This resulted in African developing countries debt service ratios increasing significantly. Finally, the restrictive adjustment-oriented policies in several developed market economies has further diminished the market for African developing countries were able to pay in 1981 for about 60 per cent of their imports from net current inflows. The direct impact on non-oil producing African developing countries of the second increase in oil prices (1979-1980) was much harder than the first due to a larger increase in oil import bill (US$2.9 billion in 1980 against US$1.2 billion in 1974.

The African imports of commercial energy reached 32.5 million tons of coal equivalent which is about equal of the consumption of solid fuel in the continent. Trade of coal in Africa involve limited quantities because all production is consumed on the internal markets.

In Africa to-day, there are seven member States which are net oil exporting countries. The role of African oil in the world oil market can be assessed in terms of individual country's reserves and production level. This is best illustrated by Nigeria which during the last thirty years has emerged from the position of a virtual non-producer to that of sixth largest oil producer in the world today. With proved reserves of 19 billion barrel of oil (and 115 billion of potential oil reserves), Nigeria controls about 34 per cent of Africa's reserves and 3.2 per cent of the entire world proved reserves. It has also been estimated that Nigeria's gas potential is enormous. The great number of African member States are heavily dependent on crude oil import and in 1980, oil import bill of African non-producers reached 7.4 billion $US that is 29.2 per cent of their export earnings and 25.5 per cent of their import bill. The World Bank predicted back in 1981 that the level of export petroleum prices will be determined in the longer term by the substitutes to conventional petroleum. Based on available estimates of these production costs there could be a doubling of oil prices in real terms during the next two decades. In view of oil glut OPEC oil prices dropped to $US29 per barrel and there was a speculation about another drop in price in 1984. However, the OPEC member States lowered the ceiling of oil production from 17.5 million bbl a day to 16.0 million in order to reduce oil glut in the world market. There are no reliable data on trade of uranium and hydroelectricity in Africa.

4. Energy policies of member States

The current energy problems in Africa cannot be solved overnight. The implementation of the objectives and priorities in energy were defined by Lagos Plan of Action which noted a lack of national energy policies in most African countries and stressed the need for an integration of energy activities in overall national development planning efforts.

The appropriate energy policies differ among developing countries of Africa. Low income countries derive more than half of their total energy from wood and agricultural or animal wastes. But many of them depend heavily on petroleum for commercial energy and are short of the resources needed to develop their own energy supplies. One of the difficult choices African developing countries face is how to stop the rapid deforestation and soil erosion without unduly stimulating the import of crude petroleum or products. A solution would be a systematic afforestation programme, introduction of small hydropower schemes, more efficient design of cooking stoves and more use of coal.

There are also other energy sector support activities that African developing countries could undertake. Many of them have serious deficiencies in the area of resources identification, geologic surveys, energy planning and training of manpower. Incomplete resource identification would reduce the economic benefits a country would obtain through stepped-up development of already identified energy resources. The only way to identify hydrocarbon resources is through geological and geophysical surveys and exploratory drilling. It should be noted that since 1978 the exploration activities in African non-oil-producing countries increased relatively slowly when compared to the surge in global drilling activity or even slowed down.

Another problem faced by African developing countries is the lack of trained manpower in the field of energy planning. While there are at present a few international energy management training programmes, national courses in African developing countries are almost non-existant. An increase of technical co-operation would go a long way to helping solve this problem through exchange of information and transfer of skills.

There is an area where domestic policy measures are needed in the African developing countries is in the development or strengthening of the domestic institutional framework. The chanelling of additional domestic and external finance into the energy sector demands an institutional framework that can adequately respond to the evolving energy situation. There is need for personnel familiar with a variety of contractual agreements and able to negotiate arrangements between different economic entities. An overall co-ordinating body or department may be needed not only to balance the competing energy demands of the various economic sectors but also serve as the focal point for foreign energy investment. Such an institution or body would also have to work together with the finance and/or economics ministries to spur the mobilization of domestic finance that would share in the risk inherent in exploration activities.

Faster energy development would necessitate speeded-up infrastructural development for energy sector activities. Bottlenecks in key infrastructural areas, such as transport facilities, refinery construction/expansion, petrochemical plant construction etc. can slow down the rate of energy resource development.

On the pricing side, maintaining domestic prices of energy resources at levels that reflect energy's real economic cost is essential to ensure that each African developing country adjusts to the evolving energy situation and that endusers are given the appropriate signals for more rational longer-term decisions. It will also encourage the more optimal use of energy resources since appropriate pricing and taxation policies of energy products will strongly encourage energy resources efficiency and conservation and interfuel substitution.

The energy sector requires large-scale investments which means that careful consideration has to be given to meeting future demands at the least cost, and determining priorities among various sources of supply. For any individual country, investment requirements and priorities depend on resources availability, relative costs, possibilities for substitution and market competition among fuels and the need for related investments. But though it is not possible to decide a priori optimal resource development strategy for an individual country, it was generally established that in the great majority of cases substantial savings would be gained by substituting domestic sources for imported oil.

It is a well-known fact that exploration for energy resources such as petroleum, natural gas and coal is a high-risk and large-scale investment enterprises. This explains why most of developing African countries (non-oil-exporters) have little or not at all capacity to undertake exploration and are therefore dependent on external sources. The impediments also include the lack of technical knowledge and skills. A solution would be to attract foreign enterprises which will undertake the exploration on an agreed basis. These enterprises need not be the major, multinational companies; They can be nationally - owned enterprises which may accept terms more favourable to the host countries. Such terms may not be accepted by multinationals which could be interested in the areas which from a global point of view, are the most promising. We understand that the policy of the African Governments is to leave the exploration for primary energy resources into the hands of the private companies, sometimes parastatal, rather than hand this to their own organizations. While exploration by private industry tends to be directed towards relatively early economic rewards and thus concentrates more on intensive high-quality local surveys, the developing countries in Africa may initiate a long-termed comprehensive programme of studies.

However the use of small enterprises presents the inconvenience that they are less able to insure themselves against failure by geographic diversification of their exploration activities.

An important role in the economic development of African countries should be played by energy efficient utilization and conservation. This issue is of great concern to all African developing countries, though the scope for energy conservation in Africa is much smaller than in developed countries. Such sectors of economy as agriculture, trade and residential rely heavily on traditional fuels and any shift from traditional to commercial fuels would place additional strain on the import bill of non-oil-producers in Africa. It is well known that no single source of energy can meet the continent's future energy requirements. Consequently, exploration for, and development of conventional sources of energy should continue at an intensified rate along with efforts to develop new and renewable sources of energy. In following this policy, a series of recommendations have been drafted by African experts attending various meetings and forwarded as guidelines for the optimum development and utilization of the continent's energy resources. The most important of these could be summarized as follows:

(a) African policy makers should implement a comprehensive and co-ordinated energy policy taking into account the special situation of individual countries and the continent's available or potential energy resources.

(b) Such a policy must be based on as complete an inventory as possible of all energy resources, their potential and possibilities for their development and use. To formulate the policy, it will be necessary to chart current or planned energy needs and catalogue energy sources able to meet those needs under the best socio-economic conditions. Energy development plans for the short, medium and long terms should be drawn up at national and subregional levels and integrated into national development plans.

(c) There should be a permanent technological and political structure responsible for energy problems as a whole at both the national level and the regional and subregional levels.

(d) National services should be set up in each country to design, plan and manage energy projects, co-ordination machineries and bodies should be established at the subregional and regional levels and these institutions should be given adequate funds and manpower to carry out their activities efficiently.

(e) Generally, African consultancy firms should be set up, upgraded and promoted to draw up and use the inventories of the continent's energy resources.

(f) The training of skilled staff at all levels and in all spheres to develop, exploit and utilize an energy resources (exploration, evaluation, planning exploitation, R & D, design and manufacture of equipment to exploit and utilize energy resources, etc.) should be considered a prerequisite and therefore be given absolute priority.

(g) Special attention should be given to the development of science and technology and stpes should be taken to collect, classify and disseminate this scientific and technological information more efficiently than is now the case.

(h) Additional seminars, study tours and advanced training courses should be organized and possibilities should be increased for African decision makers from national and intra-African institutions concerned with the energy sector to exchange information and share experience.

(i) The energy future of African countries will depend to a large extent on their ability to organize, implement and develop their own scientific and technological capacity.

5. Prospects for the future

It is now generally accepted that the energy problems of the seventies were not passing phenomenon but the crisis marked the end of an era of cheap coal and oil and the transition to high cost energy. Over the next two decades the oil price is expected to cause significant changes in the sources of supply, a large increase in investment in energy production to reduce dependence on oil and greater efforts to make energy use more efficient.

Given this situation coal is likely to make a significant comeback at the world level, Africa included. The African potential resources of coal are so large and appears to be so widely distributed and its economic competitiveness with other fuels has recently improved so much, that its revival can be effected in comparatively short period of time. Coal exploration is less risky and less costly than the exploration of other fossil-fuel resources. It is therefore reasonable to expect that African countries will increase their efforts to explore and develop their coal resources. National energy planning efforts should therefore be oriented towards an accelerated programme of coal development.

The African developing countries will continue to rely heavily on oil in their domestic consumption of energy throughout the forthcoming decade. Although both groups of countries oil-importers and oil-exporters will expand their use of natural gas, in the latter group of countries the pressure to replace petroleum will be answered by increased use of primary electricity. Thus, their energy consumption will continue to rise faster than their GNP taking also into consideration a rapid growth in their population.

A number of oil-producing developing countries of Africa are expected to increase their output of crude oil. Angola, Cameroon, Congo and Ivory Coast are among these countries. Ghana, Morocco and Sudan are expected to be able to reduce significantly their dependence on oil import.

Many African countries have carried out by now hydro surveys and feasibility studies for exploiting their hydro potential, however, because of the long lead time for such projects, hydro capacity is expected to expand only slowly during this decade.

Unless immediate action is undertaken at national, subregional and regional levels, the future of energy development on the African continent will look as follows:

(a) Most of the oil-importing developing African countries will continue to depend on petroleum as main source of energy for their industrial, transport and electrical energy generating sectors. Consequently, any economic growth will be associated with a growth in energy demand, i.e. increased demand in petroleum products and finally with a continuously negative impact on the balance of payments. As a result, a number of African countries will have to reduce their consumption of petroleum products, impending thus the development of their industrial, transport and particularly agricultural sectors.

(b) Development of hydropower resources will take place at a slow rate due to heavy capital investment needed for major hydroelectric schemes and lack of an inventory and know-how for the development of small hydropower schemes. On the other side, the electricity produced by thermal power stations will be less available due to the high prices of petroleum products.

(c) Fuelwood and charcoal will continue to be the main source of energy for rural areas and for low to medium-income population of urban areas. Neither petroleum products, nor electricity will substitute fuelwood and/or charcoal. Consequently, consumption of fuelwood and charcoal will follow the population's growth rate and facilitate an acceleration of deforestation process in those areas of the continent which are already affected by it.

6. Conclusion

A series of concrete actions should be undertaken with a view to improving the future energy situation on the continent and these can be summarized as follows:

(a) Initiation or acceleration of hydrocarbons exploration within prospective areas;

(b) Development and/or utilization on a larger scale of coal and lignite resources. Increase in utilization of peat and natural gas. Expanding exploration for and development of oil shales and tar sands;

(c) Accelerated development of hydropower resources through multinational participation, implementation of interconnection of grids, construction of long-distance transmission lines, initiation of projects for development of small scale hydropower schemes;

(d) Development of new and renewable sources of energy;

(e) Establishment of a research and development base within the energy sector. Training of manpower in the field of energy, including nuclear energy through a combined programme of training abroad and the acquisition at home of small nuclear reactors for research and training purposes;

(f) Setting up of an afforestation policy;

(g) Establishment of national, subregional and regional institutions, with elaboration of energy development programmes integrated within the overall economic development plans and policies.

The energy future of African countries will depend to a large extent on their ability to organize implement and develop their own scientific and technological capacity. This could be the right time for the concentrated positive action for countries who can always rely on support of the ECA secretariat in the implementation of the national energy programmes.

Primary energy resources[x/] of Africa

Energy carrier/ Commodity	Unit	Amount
Coal	Billion t	341.0
Crude oil	Billion t 1,000 bbl	min 17.0 - max. 34.0[xx/] 57,821,690 xxx/
Natural gas	Trillion cu. m 10^9 cu ft	min 10.0 - max 33.4 [xx/] 189,423 xxx/
Oil shales	Million t of crude oil content (yield 41.7 l/t)	7488.2
Uranium	t of U (80-130 US$/kg)	Reasonably assured 1,350,000
Thorium	t of Th	Reasonably assured 26,000
Hydropower	Mwe	200,00

x/ Resources including all categories of reserves and undiscovered recoverable potential.

xx/ Source: Visotsky et al., 1983.

xxx/ Source: International Petroleum Encyclopedea, 1983.